

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 21014503	<b>FOR FURTHER ACTION</b>	See item 4 below
International application No. PCT/EP2004/006108	International filing date ( <i>day/month/year</i> ) 07 June 2004 (07.06.2004)	Priority date ( <i>day/month/year</i> ) 13 June 2003 (13.06.2003) ]
International Patent Classification (IPC) or national classification and IPC 7 B22D 2/00, 11/18, 37/00, G01N 27/74, 33/20, C21C 5/46		
Applicant MPC METAL PROCESS CONTROL AB		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> .1(a).																								
2.	This REPORT consists of a total of 9 sheets, including this cover sheet.																								
	In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 30%;">Box No. I</td> <td style="width: 60%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input checked="" type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44 <i>bis</i> .3(c) and 93 <i>bis</i> .1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44 <i>bis</i> .2).																								

<p style="text-align: center;">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 740 14 35</p>	<p>Date of issuance of this report 13 December 2005 (13.12.2005)</p> <p>Authorized officer</p> <p style="text-align: center; font-size: 1.2em;">Ellen Moyse</p> <p>Telephone No. +41 22 338 89 75</p>
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# PATENT COOPERATION TREATY

REC'D 26 AUG 2004

WIPO

PCT

From the  
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/EP2004/006108

International filing date (day/month/year)  
07.06.2004

Priority date (day/month/year)  
13.06.2003

International Patent Classification (IPC) or both national classification and IPC  
B22D2/00, B22D11/18, B22D37/00, G01N27/74, G01N33/20, C21C5/46

Applicant  
MPC METAL PROCESS CONTROL AB

### 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

### 3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office  
D-80298 Munich

Authorized Officer

Baumgartner, R



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INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2004/006108

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. II Priority**

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1. ☒ The following document has not been furnished:

- ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).
- ☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1,5,8,10-14,20,24-27
	No: Claims	2-4,6,7,9,15-19,21-23,28,29
Inventive step (IS)	Yes: Claims	1,5,8,10-14,20,24-27
	No: Claims	2-4,6,7,9,15-19,21-23,28,29
Industrial applicability (IA)	Yes: Claims	1-29
	No: Claims	

2. Citations and explanations

see separate sheet

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**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial  
applicability; citations and explanations supporting such statement**

1. The following documents (D) are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: US-A-4 816 758 (THEISSEN WOLFGANG ET AL) 28 March 1989 (1989-03-28)

D2: PATENT ABSTRACTS OF JAPAN vol. 1998, no. 05, 30 April 1998 (1998-04-30) & JP 10 005958 A (NIPPON STEEL CORP), 13 January 1998 (1998-01-13)

D3: JP 54 119336 A (KAWASAKI STEEL CO; EDDIO CORP) 17 September 1979 (1979-09-17)

D4: JP 54 110932 A (KAWASAKI STEEL CO) 30 August 1979 (1979-08-30)

D5: PATENT ABSTRACTS OF JAPAN vol. 1998, no. 01, 30 January 1998 (1998-01-30) & JP 09 236461 A (NIPPON STEEL CORP), 9 September 1997 (1997-09-09)

D6: DE 31 42 681 A (LICENTIA GMBH) 5 May 1983 (1983-05-05)

D7: WO 02 36293 A (JALK MATS ; OHLSSON WILLY (SE); CERVANTES MICHEL (SE); KELVESJOE HA) 10 May 2002 (2002-05-10)

D8: US-A-4 144 756 (LINDER STEN V) 20 March 1979 (1979-03-20)

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claims 2 and 17 is not new in the sense of Article 33(2) PCT.

- 2.1 D1 discloses a method and an apparatus for detecting slag within a stream of molten steel being poured from a metallurgical vessel through an outlet pipe during continuous casting (abstract, fig. 1a).

The apparatus comprises one or several transmitter coils (3) for generating an electromagnetic field and one or more receiver coils (4) for receiving the field that has passed through the pipe (Fig. 1b, 4b, col.4,5).

The magnitude of the voltage induced in the receiver coil is indicative of presence of slag in the pouring stream (abstract).

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Fig. 4b shows that the coils 3,4 are embedded in the brick (7) in a fixed position relative to the pipe.

Consequently, D1 discloses all features of the apparatus according to claim 17, which is therefore not novel.

The method according to claim 2 relates to the operation of the apparatus and is therefore also not novel in view of D1.

2.2 The subject-matter of independent claims 2 and 17 is also not novel in view of D2, D3, D4, D5 and D6.

2.3 D3 (Fig. 1,2) discloses a device for detecting the presence of slag in a shroud (18) for guiding molten metal (10) from a ladle (14) to a tundish (20) comprising transmitting and receiving coils (40,42) located at the two branches of a forked coil holder (30). The coil holder is placable such that the shroud is located between the coils by the manipulator (32). The shroud must be held or fixed in a certain way, which means there must be a kind of shroud manipulator according to claim 16 of present application.

The subject-matter of claim 16 is therefore not novel in view of D3.

3. The application does not meet the requirements of Article 6 PCT, because claims 2, 6 and 7 as well as claims 16, 17, 21 and 22 are not clear.

3.1 From the description, it is understandable, that it is essential for an accurate detection of slag in the shroud, that the transmitting and receiving coils are kept unmovable relative to each other and also unmovable relative to the shroud, because movement of the shroud occurs during pouring of molten metal.

- The forked coil holder, to which the coils are mounted, ensures immovability of the coils relative to each other.

- Mounting the forked coil holder to the shroud manipulator ensures immovability of the coils relative to the shroud.

Consequently, these two features are regarded as essential features for the success of the invention.

From Article 6 PCT taken in combination with Rule 6.3(b) PCT it is derivable that

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any independent claim must contain all the technical features essential to the definition of the invention. Independent claims 2 and 17 do not contain the essential feature of the forked coil holder. Independent claims 2, 16 and 17 do not contain the essential feature, that the coil holder is mounted on the shroud manipulator.

- 3.2 Furthermore, claims 2, 16 and 17 attempt to define the subject-matter in terms of the result to be achieved ("keeping the coils unmovable relative to the shroud", "in such manner, that the [coils] are in a stationary position relative to the shroud"), which merely amounts to a statement of the underlying problem, without providing the technical features ( the forked coil holder being mounted on the shroud manipulator) necessary for achieving this result.
- 3.3 Also dependent claim 6 and 21 merely amount to a statement of the underlying problem of the relative immovability between shroud and coils, without providing the technical features necessary for achieving this result.
- 3.3 Mounting the forked coil holder to the sliding gate of the ladle instead according to dependent claims 7 and 22 does not solve this technical problem.
4. The following dependent claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty or inventive step, the reasons being as follows:
- Coils in the form of toroids, that surround the shroud, are disclosed in D1, D2, D5, and D6. The subject-matter of claim 18 is therefore not novel.
  - A forked coil holder with two branches carrying the transmitting and receiving coils and that is fixed to a separate mounting device, is disclosed in D3 and D4. The forked coil holder according to D3 is mounted to a separate mounting device (32) which is arranged to follow the position of the shroud. The subject-matter of claims 19 and 21 is therefore not novel.
  - The subject-matter of the dependent method claims 3, 4 and 6 corresponds to features of apparatus claims 18, 19 and 21 does likewise not meet the requirements of novelty or inventive step for the same reasons.
  - Electric isolation between the two branches of the holder are a necessary design feature, that is obvious to the skilled person. The subject-matter of claim 23 would

therefore not involve an inventive step.

- A directional core positioned within the coils is known from D4. The subject-matter of claims 28 is therefore not novel.
- D1-D5 also disclose the ladle, tundish and shroud. The casting plant according to claim 29 is therefore not novel.
- The generation of fields with different frequencies is known from D1. The subject-matter of claims 9 is therefore not novel.
- Cooling the induction coils is an obvious feature. The subject-matter of claim 15 is therefore not novel.

**5.1 D3 is regarded as the closest prior art with respect to independent claims 1 and 16.**

The difference between the method according to claim 1 and D3 is the fact that the forked coil holder is fixedly mounted on the shroud manipulator. This ensures relative immovability between the coils and the shroud, which is one of the apparently essential features of present application, necessary for accurate slag detection

None of the cited documents discloses a forked coil holder mounted on a shroud manipulator.

The subject-matter of claim 1 is therefore regarded as novel and inventive in view of the cited prior art and therefore meets the requirements of Art. 33(2) and (3) PCT. An amended claim 16, that also incorporates this essential feature, could also meet the requirements of Art. 33(2) and (3) PCT.

Dependent claims 4+5 and 19+20 relate to the essential features mentioned under item 3.1. Mounting the forked coil holder on the shroud manipulator is not disclosed or rendered obvious by the cited prior art (see above).

Consequently, also the subject-matter of claim 2, taken in combination with claims 4 and 5 as well as the subject-matter of claim 17, taken in combination with claims 19 and 20 would meet the requirements of Art. 33(2) and (3) PCT.

**5.2 D2 discloses that the flow rate of molten metal is also taken into account for defining a standard value that serves as a basis for comparison of the detected voltage level.**

However, the additional features of dependent claims 10 and 24 of determining the flow of molten metal and defining the voltage range, that is indicative of the



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presence of slag, depending on the magnitude of the flow, are not disclosed or rendered obvious by the cited prior art. This improves the accuracy of the slag detection.

The subject-matter of these claims would therefore also meet the requirements of Art. 33(2) and (3) PCT

- 5.3 Changing the frequency upon turbulent flow detection according to claim 8 is also not disclosed or rendered obvious by the cited prior art. The subject-matter of claim 8 would therefore also meet the requirements of Art. 33(2) and (3) PCT

6. Further remarks

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the cited documents, in particular D1-D4 is not mentioned in the description, nor are these documents identified therein.

The two part form of the claims is not adopted to the subject-matter disclosed in these documents D1-D4.

Present set of claims consists of more than one independent claim per category: two method claims (1,2) and two apparatus claims (16,17).